Extreme Precipitation, Flooding, and Landslides

While precipitation is essential to our very existence, sometimes a location can be inundated with rainfall, which may result in flooding and/or landslides. NASA and the City of Rio de Janeiro are working together to support innovative efforts to better understand, anticipate, and monitor hazards, including heavy rainfall, sea level rise, and landslides, in and around the city. This collaboration leverages the unique attributes of NASA's satellite data and Rio de Janeiro's management and monitoring capabilities to improve awareness of how the city of Rio may be impacted by hazards and affected by climate change.

Flooding can occur when extreme precipitation results in water flowing into locations that are generally dry. This often results in the loss of property and lives, and is a source of concern for resident of Rio. Landslides are one of the most pervasive hazards in the world, resulting in more fatalities and economic damage than is generally recognized. They are a prevalent problem for residents of Rio and across the country of Brazil. Intense or prolonged rainfall can saturate the soil on vulnerable slopes and cause landslides. But understanding the land and weather conditions that lead to landslides on larger scales or within developing countries is often difficult because of the lack of ground-based information to provide rainfall and landslide information.

To better understand and predict floods and landslides, scientists have developed hydrological models based on how much rainfall occurs and where the water will likely go once it hits the ground. They use satellite rainfall datasets along with ground-based rainfall gauges within these models to provide near estimates of when and where areas may flood. While the majority of flood models currently focus on local or regional scales — taking into account one drainage basin or watershed — some recent research has shifted to estimating areas of potential flooding on a global scale. The Global Flood Monitoring System (GFMS) uses Tropical Rainfall Measurement Mission (TRMM) and Global Precipitation Measurement (GPM) data within a hydrologic model to estimate potential flooding conditions in near real-time, considering stream flow, water routing and existing river networks. Other flood modeling efforts have integrated satellite data to estimate potential flooding across regional to global scales.

NASA provides satellite imagery and data from its fleet of Earth-observing satellites that is openly available to the public. Products derived from these sources are of potential value to diagnose hazards within the region. The City of Rio de Janeiro provides in situ data and evaluates the routine application of Earth-observing data for monitoring efforts, decision support, and action.

Resources in English:
- NASA- Visible Earth, "Rio de Janeiro: A Changing City", article
  http://visibleearth.nasa.gov/view.php?id=88103
- "Floods in Rio de Janeiro State Displace over 500" article,
  http://floodlist.com/america/brazil-floods-rio-de-janeiro-state-petropolis-january-2016
- The Rio Times: many articles about flooding events in Rio and Brazil:
  http://riotimesonline.com/brazil-news/tag/floods/#
- NASA- Visible Earth, "Landslides in Brazil"- http://visibleearth.nasa.gov/view.php?id=49120
- NASA- Earth Observatory, article-
  http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=48854
- The Guardian, "Brazil Landslides Leave Hundreds of People Dead", article-
  https://www.theguardian.com/world/2011/jan/12/brazil-landslide-leaves-115-dead